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attacks sulphides, but otherwise is of much value in separating mixtures of heavy minerals.

La Touche[10] describes an apparatus to be used in connection with diffusive columns of methylene iodide for the purpose of determining the density of minute fragments of minerals.

GEOLOGY AND PALEONTOLOGY.

Geology of the French Congo.—The Congo region belonging to France is greater in extent than the parent country. Through the enterprise of different explorers and the researches of scientific men, notably geologists and paleontologists, much information concerning this great tract of country has been acquired since 1871. M. Barrat has systematized the facts on record and publishes an interesting paper under the title " Geology of the French Congo," in which he embodies also the results of his own explorations in the valley of the Ogoove.

The observations of M. Pouel, made during a stay of many years in the region under discussion, confirm the conclusions of M. Barrat as to the great stratigraphic uniformity of the Congo. Furthermore, the formation of the basin after the uplift of the African plateau is explained by the progressive draining of a series of reservoirs, more or less depressed, placed at different altitudes and discharging from one to another toward the ocean. The limits of these reservoirs are in relation to the ancient rock ridges now hidden beneath the sandstone but occasionally laid bare by erosion.

Around the border of the basin, the formations plainly demonstrate that they were elevated as early as the carboniferous epoch, and although greatly leveled since, still show the primary reliefs. One of the most interesting is the formation of Adamaona ; its substratum is granitic and metamorphic like the Crystal Mountains and the Mouamba Mountains and the region of Katanga, and there are also rocks which are similar to the Devonian of the Lower Congo. The whole formation has been intersected and to a great extent covered by erupted material, probably Cenozoic, and by outflows from volcanoes of undoubtedly much more recent age.

The structure of the plateaus of Adamaona is somewhat analogous to that of the central plateau of France. (Extr. Ann. des Mines liv. d'Aril, 1895.)

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[10] Nature, Jan., 1896, p. 198.

Geology of the Nile Valley.—In a paper on the geology of the Nile Valley, Prof. E. Hull calls attention to the two great periods of erosion in this region, the first during the Miocene period, after the elevation of the Libyan region at the close of Eocene times, and the second during a " pluvial " period extending from late Pliocene times into and including the Plistocene. In the second part of the paper the terraces of the Nile Valley are described and full details given of the characters of a second terrace, at a height varying from 50 to 100 feet above the lower one, which is flooded at the present day. This second terrace is traceable at intervals for a distance of between 600 and 700 miles above Cairo. Two old river channels are also described, one at Kom Ombo and the other at Assuan itself. The author discusses the mode of origin of the second terrace and the old river valleys, and believes them to be due to the former greater volume of the river and not to the subsequent erosion of the valley. He gives further evidence of the existence of meteorological conditions sufficient to give rise to a " plnvial " period, and points out that other authors have also considered that the volume of the Nile was greater in former times. (Nature, March, 1896.)

The Antarctic Continent.—Mr. C. Hedley has published the data to date concerning the forms of life held as common stock by the converging land masses of the southern continent, together with the conclusions reached by several naturalists as to a former antarctic land area and the continuity of the southern land masses. The author states that the evidence collected tends to show Antarctica as an unstable area, at one time dissolving into an archipelago, at another resolving itself into a continent. From the distribution of the pond snail Gundlachia, he argues a narrow land connection during Mesozoic time between Tasmania and Terra del Fuego across the south pole, and that New Zealand at that time reached sufficiently near to this Antarctic land to receive by flight or drift many plants and animals (Proceeds. Roy. Soc. N. S. Wales, 1895).

Two Epochs in Vegetable Paleontology.—A late number of Science contains a tribute by Lester Ward to the memory of two eminent paleontologists, Marquis de Saporta and Professor William C. Williamson. In the author's judgment, the most important contribution of the former to science is the conclusion that the most important subdivisions of the geological scale must be drawn at different points for plant development from those at which they are commonly drawn for animal development. For example, the Mesophytic age properly ends with the Jurassic instead of with the Cretaceous, while the tertiary for fossil plants closes with the Miocene instead of with the Pliocene.

Of the many important discoveries made by Williamson, the most valuable is the demonstration of the existence of exogenous structure in the Carboniferous Pteridophytes. (Science, Vol. II, 1895.)

The Appalachian Folds.—The faults and folds in Pennsylvania Anthracite beds are most admirably shown by Dr. Benjamin Smith Lyman in a paper illustrated by thirty-three page plates containing 177 sections. These sections were prepared by the author from the valuable cross-section sheets of the State Geological Survey, and are accompanied by a key map showing where the sections are made. From a comparison of these cross sections Dr. Lyman draws the following conclusions:

"Steep northerly dips in the Pennsylvania anthracite region are much less prevalent than was formerly supposed; nearly half the basins and saddles are about symmetrical; nearly three-fourths of the subordinate ones are so in the Western Middle field; less than quarter of the main ones are so in the Southern field. Again, the subordinate folds throughout the region are confined to subordinate groups of beds of inferior firmness, and are not parellel to the main folds, but probably at uniform profile distances from the main axes, so as to descend the flanks of a sinking anticlinal. Further, that the faults are most invariably longitudinal or reversed faults, occasioned by the overtraining of subordinate folds, and corresponding in three-fourths of the cases to an overturned southerly dip, with the upthrow to the south; such broken subordinate folds, whether dipping southerly or northerly, ride in equal number on the northerly dipping and southerly dipping sides of the main folds; the stratigraphic throw averages only about 62 feet, and never exceeds 160 feet; the displacement averages 72 feet, and never exceeds 240 feet." (Trans. Amer. Institute Mining Engineers, 1895.)

The Ancestry of the Testudinata.—In the NATURALIST for 1885, I advanced the hypothesis that the order of the Testudinata arose from the Paleozoic order of the Theromora. In the latter I included at that time the forms I afterwards distinguished as an order under the name of Cotylosauria. In 1892 (Transac. Amer. Philosoph. Society, p. 24) I specified that the Testudinata must have been derived from this latter order. It is now possible to bring positive evidence that this view is correct, since the anticipation so expressed is now verifiable. Parts of the skeletons of a new form of Cotylosauria from the Permian bed has come into my hands, which represents a new family of the order, and one which may well have been ancestral to the Testudinata. (See NATURALIST, 1896, April for a description of the order). The family may be defined as follows:

OTOCŒLIDÆ fam. nov. Cranial roof excavated laterally behind, forming a large meatus auditorius. Teeth present, in a single row, not transversely expanded. Ribs immediately overlaid by parallel transverse dermoössifications, which form a carapace.

To this family I refer two new genera, viz., Otocœlus and Conodectes, which differ as follows:

Suspensorium directed anteriorly, except at free extremity; nostrils lateral; *Otocœlus.*

Suspensorium directed posteriorly; nostrils vertical; *Conodectes.*

OTOCŒLUS, has the following characters: Intercentra present. Teeth subconical. Mandible not projecting beyond quadrate. Clavicle expanded at both extremities, overlapping the episternum. Scapula with a proscapular lamina. Ribs transversely expanded, not united by suture with each other, alternating with the dermal bands. Limbs well developed.

The type species of the genus Otocœlus is the

OTOCŒLUS TESTUDINEUS sp. nov. The skull is short wide and flat, and the orbits are large and are situated near the auricular excavations. Surface roughly sculptured with small pits and ridges. Malar and mandibular bones shallow. Teeth small, com pressed conic smooth, and without serrations. Scapular arch without sculpture of the inferior surface. Humerus with widely expanded head and narrow shaft. Bands of carapace of moderate transverse extent, and roughly sculptured with pits and tubercles, Width between auditory meatuses 74 mm.; do. between orbits 32 mm.; do. between auditory sinus and orbit 16 mm.; transverse diameter of orbit 30 mm.; depth of mandibular ramus below middle of orbit, 28 mm.; width of carapace 80 mm.; length of clavicle 80 mm.; transverse width of head of humerus 35 mm.; length of femur 67 mm.; length of vertebral centrum 10 mm.; width of do. 19 mm.; width anterior rib distally 11 mm.

A second species is the *O. mimeticus* Cope. But one species of Conodectes is known, the *C. favosus* Cope.

This form is of especial interest since it constitutes, with the genus Dissorhophus which I described in the NATURALIST for 1895, p. 998, a remarkable example of homoplassy. It is doubtful whether the carapaces of the two forms could be distinguished externally, but Dissorhophus is a Stegocephalian Batrachian with rhachitomous vertebræ, while the present form is a Cotylosaurian reptile. Although so similar superficially, the carapaces of the two differ as follows. In Dissorhophus transverse expansions of the neural spines of the vertebræ support the transverse dermal bands below, and the ribs are free, and only reach the border of the carapace by their extremities. In Otocœlus the neural spines are not expanded, and the dermal bands rest immediately on the ribs.—E. D. Cope.

The Extent of the Triassic Ocean.—In a short note contributed to the Paris Academy of Sciences on December 30, Prof. Iness calls attention to the striking geographical results of the researches of his Vienna colleagues on the marine Triassic fauna. While to English geologists the Trias is the typical example of an unfossiliferous land deposit, the work of Mojsisovics on the contemporaneous deposits of the Alpine region has been the starting point for a series of discoveries in many parts of the world. A rich marine Triassic fauna is now known, extending from Spain to Japan and California, and from Spitzbergen to New Zealand. Yet among the thousands of these fossils gathered together in Vienna from all parts, there is not a single marine fossil from the regions bordering the Atlantic or Indian Oceans. The conclusion is obvious, thas the regions of these modern oceans were not covered by sea in Triassic times. On the other hand, all the districts bordering the Pacific and Mediterranean yield the marine forms, as does a great stretch of land extending from the Mediteranean to the Pacific through Central Asia, and another extending from the Pacific through Eastern Siberia to the Arctic Ocean. Thus the Pacific Ocean was the main ocean in Triassic times, and stretched out two arms across the continental region—the one called the Tethyan ocean, of which the Mediterranean is the last remnant, the other, the Arctic branch. This distribution of the Triassic seas strikingly agrees with that of the structural features of modern coast lines indicated by Neumayr: the oceans bordered by lands with marine Trias are the oceans of the *Pacific type*, of which the coasts are determined by the convex margins of earth folds; while the oceans of *Atlantic type*, of which the margins cut across the mountain folds, are those around which the only fresh water Triassic strata are found. Thus is confirmed the opinion that the latter oceans are of comparatively recent origin, and have been produced by a process of wholesale depression, which has cut off the three great triangular upstanding masses (or *horsts*) of Greenland, Africa and India, which form so striking a feature on the surface of our planet. (Nature, Jan., 1896.)

The Ancient Beaches of Erie and Ontario.—In his correlation of the moraines of western New York with the Raised Beaches (Crittenden and Sheridan) of Lake Erie, Mr. Leverett makes the following statement in regard to the Lake Outlets:

"The evidence is clear that during the formation of the upper two beaches an outlet was found to the Wabash, past Fort Wayne, Indiana. At the time the third or Belmore beach was formed (and its probable continuation, the Sheridan beach) this outlet had been abandoned. It is thought that the ice sheet had retreated so far from the Huron and Michigan basins as to open a lower outlet through these basins than past Fort Wayne. It seems improbable that an eastward outlet was then open, for the district south of Lake Ontario was apparently still occupied by the ice sheet. It is evident that no outlet to the east could have existed until the ice sheet had withdrawn from the Lockport moraine sufficiently for a passage eastward along its southern margin. If my interpretations are correct, the Crittenden beach had been for a long time occupied by the lake before an eastward outlet was opened, a time sufficient, not only for the Lockport moraine, but for several other slightly older minor moraines to be formed. During that time, the lake in all probability discharged westward through the Huron and Michigan basins past Chicago. When the gates to the eastward were opened by the withdrawal of the ice sheet there was probably a brief period in which the lake discharged through the Seneca Valley into the Susquehanna. But soon the lower outlet by the Mohawk was opened and the lake fell rapidly to that level, leaving but feeble traces of beach or wave action in its intermediate stages." (Amer. Jour. Sci., Vol. L, 1895.)

Geological News.—GENERAL.—The periods of volcanic activity in New Brunswick, as stated by Wm. D. Matthews, are:

1. *Huronian.*—Southern New Brunswick and the northern watershed.
2. *Silurian and Early Devonian.*—Passamaquoddy Bay, Baie Chaleur, etc.
3. *Sub. Carboniferous.*—Borders of the central plain, Grand Lake, Blue Mountains of the Tobique.
4. *Triassic.*—Quaco, Grand Manan. (Bull. Nat. Hist. Soc., New Brunswick, No. XIII, 1895.)

PALEOZOIC.—The "shists lustrés" of Mont Jovet are shown by Dr. Gregory to be older than the Trias (1) by the occurrence of fragments of the schists in the Trias; (2) by the discordance of strike between the two series; (3) by the occurrence of masses of dolomite resting unconformably on the flanks of the shists; and (4) by the fact that the Trias has escaped the metamorphism which the schists have undergone. (Quart. Journ. Geol. Soc., 1896.)

Mr. C. H. Gordon's investigations of the St. Louis and Warsaw formations in southeastern Iowa furnishes evidence in favor of Calvin's conclusion that dolomites are essentially offshore products. (Journ. Geol., Vol. III, 1895.)

CENOZOIC.—Certain data accumulated by H. B. Kümmel indicate the glaciation of Poconò Knob and Mts. Ararat and Surgar Loaf in Wayne County, Pennsylvania. It has been hitherto held by the Pennsylvania State Geologists that these peaks were nunataks. (Amer. Journ. Sci., 1876.)

According to Dr. Grossmann, glacial phenomena in the Færoes comprise roche moutounées, glacial striæ, glacial mounds and boulder clay. The author states that there is no doubt that the islands had a glaciation of their own, a conclusion which is inconsistent with the hypothesis of a big northern ice cap. (Geog. Journ., Vol. VII, 1896.)

M. Harlé has identified the canine tooth and phalangeal bones of a lion, two molar teeth of a reindeer, and a molar tooth of an elan (Alces) in the fragmentary specimens from the Tourasse caverns in the southwestern part of France. From the evidence of other remains, M. Regnault fixed the age of this cave as intermediate between late Paleolithic and Neolithic. The presence of lion remains at Tourasse shows that this carnivore lingered long in the Pyrenees. (L'Anthropol., 1894.)

CAVE EXPLORATIONS IN TENNESSEE.—We discovered the tapir-peccary layer in the cave breccia together with a later fauna in a layer of cave earth, associated with Indian remains, in Zirkel's Cave near Mossy Creek, east Tennessee. Prof. Cope, our informant, had previously found the former in 1869.—H. C. MERCER.

BOTANY.[1]

The Conifers of the Pacific Slope.—Every botanist who is interested in the Conifers (and what *botanist* is not?) will be pleased with the pocket edition of Mr. J. G. Lemmon's "Hand-book of West American Cone-bearers," which appeared somewhat less than a year ago. It is a duodecimo volume of about a hundred pages, and includes seventeen half-tone plates, from photographs, of the foliage, cones, and other characteristic features. The text consists of brief descriptions of the genera and species, interspersed with notes, discussions and narra-

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[1] Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.